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## AESTHETIC PROPERTIES OF GEOLOGICAL HERITAGE LANDSCAPES: EVIDENCE FROM THE LAGONAKI HIGHLAND (WESTERN CAUCASUS, RUSSIA)

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**Abstract:** Beauty adds value to unique geological features because the former is important for tourist emotional satisfaction. Aesthetic properties of geological heritage landscapes (landscapes dominated by unique geological phenomena) should be distinguished from their aesthetic attractiveness. Field studies permit ranging all basic aesthetic properties according to their local importance. The same information allows realizing appearance of the properties, which can be either positive or negative. The aesthetic properties of a world-class geosite representing ancient carbonate platform and diverse karst features, namely the Lagonaki Highland (western part of the Greater Caucasus Mountains) are examined. It is established that the Lagonaki Highland has physical parameters that determine a specific set of aesthetic properties. Three most important aesthetic properties of the studied object are openness, pattern, and uniqueness. These properties match the expected tourists' idea of beauty, and, thus, the geological heritage landscape of the Lagonaki Highland is characterized by significant aesthetic attractiveness, which is important for tourism development.

**Keywords:** natural beauty, geological heritage, geotourism, landscape perception, Caucasus

### Introduction

Geological heritage has been realized as a major topic for research, practical conservation, and tourism development in the past decades (Prosser, 2013; Henriques & Brilha, 2017). Unique geological phenomena are important to the modern society. The key question is determination of this uniqueness, which means not only analysis of rarity, but also consideration of auxiliary properties, including aesthetics (Zhang, 2006; Mikhailenko, Nazarenko, Ruban, & Zayats, 2017; Gordon, 2018). Perceived natural/scenic beauty of geological objects is especially important because significant number of their visitors (geotourists) do not have proper geological knowledge/education; as a result, these pay attention to properties that allow judgments in the “like–dislike” frame.

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Importantly, unique features occur in the natural landscape context, and, thus, these are comprehended together with this context. This is especially the case of big geological heritage sites (geosites) and viewpoint geosites (term of Migoń & Pijet-Migoń, 2017). If so, it is sensible to introduce the term “geological landscape” and to define it as a more or less natural landscape dominated by well-visible geological features. Another term, namely “geological heritage landscape” (GHL) can be used to describe landscape dominated by unique geological phenomena. Such landscapes are ideal to geotourism development. This paper presents an approach for assessment of aesthetic properties of GHLs. Its application is illustrated by an example from the Caucasus Mountains.

### Geographical and geological setting

The Lagonaki Highland is a large elevated area in the Russian South. Geographically, it belongs to the western part of the Greater Caucasus (Western Caucasus) (Figure 1). This highland occupies an area up to 500 km<sup>2</sup>, and it is a kind of bundle of several cuesta-like ranges, gentle slopes of which form inclined plateau-like surfaces. The elevations exceed 1,500 m, and the highest point is Fisht (2,867 m). The Lagonaki Highland is known as one of the wettest places of Russia with the total annual rainfall exceeding 3,500 mm. It is also famous for its exceptional biodiversity with numerous endemic plant species.

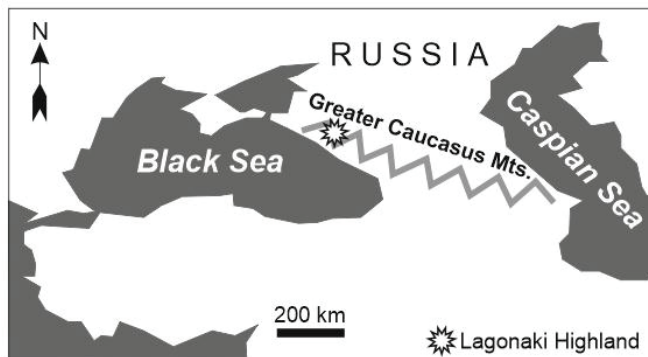


Figure 1. Location of the study geosite

Geologically, the Lagonaki Highland represents the Late Jurassic carbonate platform of rimmed shelf type that was formed in a warm Caucasian Sea about 160 million years ago. The most distinctive feature is karst that appears as both epi-karst and endokarst (Lozovoj, 1984). The entire Lagonaki Highland has been recognized as a world-class geosite (e.g., Ruban, 2010), which represents carbonate platform and karst phenomenon. Geological features dominate the

Lagonaki Highland, and, thus, the latter can be defined as GHL. The territory of the highland is embraced by the state biosphere reserve, and it is also a country-scale tourist (also ecotourist) destination.

### Theoretical framework and methodology

Natural/scenic beauty is a complex idea (e.g., Han, 2010; Schirpke, Tasser, & Tappeiner, 2013; Earle, 2015; Chen, Sun, Liao, Chen, & Luo, 2016; Reiter & Geiger, 2018), which also creates an aspect in geological heritage studies (Zhang, 2006; Mikhailenko et al., 2017; Gordon, 2018). With regard to natural/scenic beauty, two terms are in use, namely “aesthetic properties” and “aesthetic attractiveness”. Despite their evident relationship and common mixing in use, these terms refer to different ideas. Aesthetics describes people's judgments of beauty, which refer to some physical parameters of landscapes. It is sensible to define aesthetic properties of GHL as certain physical characteristics that determine its perception as beautiful or not. Aesthetic attractiveness results from visitors' judgments of aesthetics through the “prism” of collective and individual (also experience-based) preferences (Figure 2). This means that examination of GHL permits finding the only aesthetic properties.

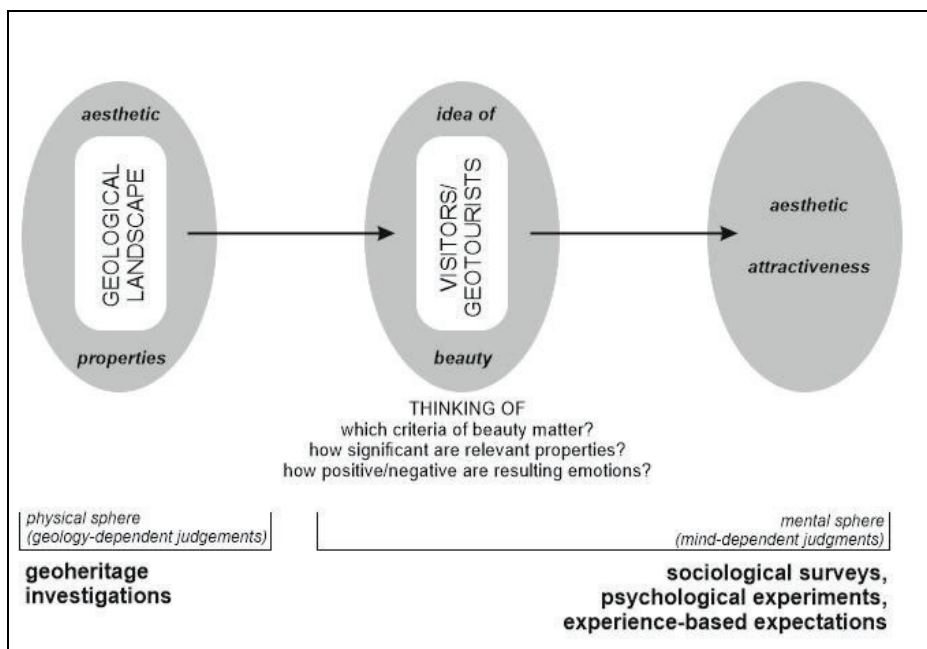


Figure 2. Aesthetic properties and aesthetic attractiveness of geological heritage

It is crucial to find and to classify those physical parameters of GHL that constitute its aesthetic properties. A classification of indicators of tourist attraction beauty proposed by Kirillova, Fu, Lehto, & Cai, (2014) can be used for this purpose. It is logical to believe that tourists judge about GHL aesthetics similarly to how they do these in other cases. These parameters are basic aesthetic properties (Table 1). The classification of Kirillova et al. (2014) can be extended with a new sub-category, namely pattern (Mikhailenko et al., 2017).

Table 1. Basic aesthetic properties of geological landscapes resulting from common criteria for tourist judgments of beauty

Category	Sub-category
Scale	Intensity of color, physical proportion, presence of people, abundance of visual cues, openness
Time	Perceived age of object, perceived age of people
Condition	Cleanness, upkeep
Sound	Lively sound, natural sound, volume of sound
Authenticity	–
Diversity	–
Novelty	–
Shape	Degree of complexity, angularity, symmetry, pattern
Uniqueness	–

Source: Modified from Kirillova et al. (2014).

The approach proposed in this paper and applied to the Lagonaki Highland is two-folded. First, field studies permit ranging all basic aesthetic properties according to their local importance. This evaluation is necessary because each given geosite may have only a limited set of physical parameters that determine only certain aesthetic properties, and each of these parameters may appear with a different intensity. Second, the same information allows realizing appearance of the properties: e.g., significant symmetry of objects implies positive appearance of the symmetry property, asymmetry of objects implies its negative appearance.

The results of application of the approach describe objective parameters of the GHL of the Lagonaki Highland that determine its aesthetics. If later we establish that potential visitors prefer, say significant angularity and this angularity appears locally, this means that the available aesthetic property transforms into the aesthetic attractiveness.

## Results

The Lagonaki Highland has physical parameters that determine a specific set of aesthetic properties. The local importance of the latter differs (Table 2). The most important are openness, pattern, and well-visible uniqueness.

Table 2. Aesthetic properties of the Lagonaki Highland

Property	Local importance	Appearance
Intensity of color	++	positive
Physical proportion	+	positive
Presence of people	+	negative
Abundance of visual cues	++	positive
Openness	+++	positive
Perceived age of object	+	positive (ancient age)
Cleanness	++	positive
Upkeep	+	positive
Natural sound	++	positive
Volume of sound	++	positive
Authenticity	++	positive
Diversity	+	negative
Degree of complexity	++	positive
Angularity	+	positive
Pattern	+++	positive
Well-visible uniqueness	+++	positive

Source: Author's interpretations based on Table 1.

The Lagonaki Highland is characterized by the prevalence of “flat” surfaces, which allow long-distance visibility of GHL elements and panoramic views. Moreover, this highland is elevated relatively to the neighboring areas. This almost unlimited openness corresponds to one of the aesthetic properties appreciated by tourists (Kirillova et al., 2014). Its practical importance is linked to the excellent visibility of geological heritage features from many points.

Three kinds of patterns are available in the Lagonaki Highland. First, the high cliffs of cuesta-type internal ranges with large-scale Late Jurassic carbonate rock outcrops and permanent and temporal snowfields look like waves on the seashore. This impression is so evident that one range is called officially as the Stonesea Range. Practically, this pattern facilitates understanding (via a series of mental associations) of existence of sea on the territory of the Western Caucasus ~ 160 million years ago. This is very helpful in guidance of geotourist excursions. Second, limestones and dolostones demonstrate well-visible layering that makes a visual effect of large stripes; blocks separated as a result of karstification may look like sculptures (Mikhailenko et al., 2017). Third, the entire landscape looks “spotted” and “painted”. “Spots” result from dispersed occurrence of karst sinkholes and small snowfields on “plains” covered by green grass. “Painting” reflects vegetation cover, i.e., small forests of pine and birch and large meadows with colorful flowering plants.

The uniqueness of the GHL of the Lagonaki Highland is easy to realize. This results from very unusual view of the place, presence of karst features that are uncommon for the Russian South, and apparent absence of human footprint. There are some other, less important aesthetic properties of the Lagonaki Highland (Table 2). From these, abundance of visual cues, diversity, and sound should be specially explained. Openness of the highland allows panoramic views with many visible geological and other landscape features. However, these often appear too small and too similar, which reduces the importance of this property. The diversity of geological and landscape features is moderate-to-low. Visitors may note yellowish-grey rocks, light-green meadows, dark-green forests, and white snowfields that form a “monotonous” landscape. Permanent and often strong winds together with seasonal bird singing produce natural sound that becomes associated with the local landscape. Thus, the latter turns to be also a soundscape. The latter is of big importance for nature beauty perception and tourist satisfaction (Kirillova et al., 2014; Putland, Constantine, & Radford, 2017; Farina, Gage, & Salutari, 2018; Jiang, Zhang, Zhang, & Yan, 2018; Liu, Wang, Liu, Yao, & Deng, 2018; Ren, Kang, Zhu, & Wang, 2018).

### **Discussion**

The established aesthetic properties of the Lagonaki Highland create a specific frame for its perception by tourists. Those who prefer visiting open, patterned, and unique natural areas will likely judge it beautiful and be satisfied. Although special investigations are necessary for the understanding of how the established aesthetic properties will be perceived and judged (Figure 2), some experience-based expectations are possible. Openness in the high mountain sector of the Western Caucasus is unusual. Tourists can either enjoy it or be afraid. The author's observations of the visitors' reaction imply the both options are possible. As for the patterns, these usually address to the very essence of the nature beauty perception because these make landscape “vivid” and unusual (pattern is judged by definition as a result of artist work and finding this in nature stimulates positive emotions and admiration). The same seems to be true for uniqueness because it is the very aim of travelling to find something really unique. This is why two aesthetically properties of the GHL of the Lagonaki Highland will result in its high aesthetic attractiveness.

The importance of high aesthetic attractiveness for (geo)tourism development is determined as follows. First, unique geological features of this geosite are most easy to perceive from large distance, and the factor of natural/scenic beauty cannot be ignored in this case. Second, many visitors of the highland do not have proper geological background, and visual characteristics of the features is more

clear to them than their scientific essence. Third, appreciation of the natural beauty is in the “core” of nature-based tourism (including ecotourism — see Cetin, Zeren, Sevik, Cakir, & Akpinar (2018)), and, similarly, the beauty of geological objects is something very important by definition.

### Conclusion

The undertaken study permits making three general conclusions. First, aesthetic properties of GHs should be distinguished from their aesthetic attractiveness. Second, the most important aesthetic properties of the Lagonaki Highland are linked to landscape openness, pattern, and well-visible uniqueness. Third, expectations of visitors' reaction to the established properties imply the studied GH has aesthetic attractiveness significant for tourism and, particularly, geotourism development.

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